CLASSIFICATION C-O-N-F-I-D-E-N-T-I-A-L

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CENTRAL INTELLIGENCE AGENCY

INFORMATION [redacted]

REPORT

CD NO.

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COUNTRY	USSR (Abkhazskaya ASSR)	DATE DISTR.	10 June 1955
SUBJECT	Atomic Research Institute Headed by Manfred von Ardenne	NO. OF PAGES	28
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DATE OF INFO.		SUPPLEMENT TO REPORT NO.	

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Comments 25X1

1\. 25X1

2\. The statement in paragraph 3 of the attached report regarding the subordination of Von Ardenne's institute is incorrect. The Ninth Directorate of the NKVD (later MVD) was established during World War II and took over the functions of the Special Technical Bureau, which was concerned with technical questions, and probably included all laboratories of the NKVD. After the establishment of the First Chief Directorate, subordinate to the Council of Ministers, all those laboratories and functions concerned with atomic energy were transferred to this directorate from the Ninth Directorate. Von Ardenne's institute, therefore, was subordinate to the First Chief Directorate of the Council of Ministers.

3\. The full name of General Zavenyagin, mentioned in paragraph 3, is Avraamiy Pavlovich Zavenyagin. The full name of General Kochlavashvili is Aleksandr Ivanovich Kochlavashvili.

4\. In paragraph 3 (and subsequent paragraphs), read Tbilisi instead of Tiflis. In paragraph 4, read Yerevan instead of Yerivan. On page 26, read Sungul instead of Zungul.

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COUNTRY USSR REPORT NO.

TOPIC Atomic Research Institute Headed by Manfred von Ardenne

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DATE OF CONTENT 25X1

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REFERENCES

PAGES 5 ENCLOSURES (NO. & TYPE) sketches with legends 25X1

REMARKS 25X1

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1. The area of the atomic research institute at Sinop had the shape of a trapezoid and measures about 600 x 1,200 meters. It was surrounded by a fence and was located in mountainous terrain about 3 km southeast of Sukhumi, northeast of Kelasuri railroad station . The west side of the institute area ran parallel to the highway to Agudzera. The seashore was 200 to 300 meters distant from the institute. The main fence of the institute area ran through the wooded hills rising from a valley. Several of the installations of the institute such as "House D", "House J" and the carpenter shop were fenced in separately. The eastern and western blocks of dwelling houses were also secured by fences. Along the highway to Agudzera, the fence was additionally secured by wire rolls. A rivulet, about 4 meters wide, crossed the institute area. [1]

2. The installations of the institute fall into two different groups, the institute buildings proper, the dwelling houses and auxiliary buildings. [2] Water was supplied to the institute from Kelasuri, and electric power via a transformer and underground cables from Sukhumi. At a later date, power was also delivered by a new hydro-electric power station, about 70 km north of the institute. The village of Agudzera received its electric power through the transformer of the institute by means of an overhead line. "House J" was also connected to this overhead line. The roads leading from the highway to the old institute buildings were provided with an asphalt cover and extended toward the east.

3. In 1950, the institute employed 220 Soviet and 110 German personnel including 8 PWs. Prior to 1950, 160 Germans had worked at Sinop. Some scientists were transferred including Dr. Menke who left with his group of biologists in February 1949. Menke had worked on effects of radiation. The institute was subordinate to the 9th Department of the Ministry of the Interior in Moscow. In 1948, this department was redesignated "First Administration". Head of this administration was General Zavenyagin (fnu), its technical managers were General Zveryev (fnu) and Professor Novikov (fnu). General Kochlavashvili (fnu) was in charge of the institutes at Sinop and Agudzera, possibly also of Tiflis University and an institute in the Crimea. Kochlavashvili lived at Sinop and Manfred von Ardenne was responsible to him.

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4. Ardenne's Soviet counterpart was a technical director who also was in charge of the administration of the institute. This Soviet director was a Grusinian and a well-known Soviet nuclear physicist who had connections to Tiflis and Yerivan Universities. He seldom interfered with the work of the German scientists. The German section of the institute included an Electro-Physical Department headed by Ardenne, a Mechanical Physical Department headed by Steenbeck, and a Chemical Department headed by Thiessen. Some independent departments which worked for the entire institute were also available.

5. In June 1947, the Soviets requested that a stream of ions of 20 mA be produced. Available for the execution of this order was a 60-ton separating magnet which had previously been used in Manfred von Ardenne's Berlin laboratory. 3 The magnet was designed by order of the German Postal Administration by the Austrian Firm of Elin, presumably during WW II or shortly before its outbreak. The magnet was about 260 cm high and its outer diameter measured about 240 cm. The diameter of the core was 76 cm; the pole gap was 40 cm. The windings of the magnet consisted of copper piping which was cooled by water. Field intensities ranging from 5,000 to 11,000 gauss and for short periods field intensities of even 17,200 gauss were obtained. The power was furnished by an exciting set which produced a stabilized direct current of 110 V and 70 A, 7.7 kW. 3

6. The vacuum which had the shape of a chamber measuring 90 x 90 x 40 cm and which consisted of brass plates, 22 mm thick, was placed into the magnetic field. The joints of the chamber were sealed by rubber. The operating vaccum was 10^{-6} but it dropped over the weekend to 10^{-4}. The walls of the chamber had openings for the insertion of the ion source and the collector and were also fitted with a number of inspection windows. 4 The ion source was fixed while the collector and the slit system ("Schirmgitter") could be adjusted during operations, the collector mechanically and the slit system by means of electric control. The walls of the vacuum chamber had numerous holes for electric wires and cooling pipes. Encased in the vacuum chamber was a second chamber the walls of which consisted of gauze, the top and the bottom were made of thin sheet tantalum. This second chamber which was also called a "physical chamber" (Physikalische Kammer) rested on porcelain insulators.

7. The collector consisted of a water-cooled metal plate measuring 50 x 200 x 10 mm. After experimenting with various types of metal including tantalum, a copper plate was used for the collector after 1948. The collecting of ions could be observed through the inspection windows, and it showed by a yellow decoloration of the copper plate. The amount of ions collected was measured by means of a mA-meter (electrometer?) which was connected to the high-tension circuit leading to the uranium crucible and collector.

8. The development of the ion source posed a difficult problem in regard to the type of metal to be used, because for the vaporization of uranium temperatures of 2,335° C were required. Moreover, it was necessary to keep the size of the source as small as possible and provide it with cooling devices. The experiments made in order to determine the most suitable type of ion source lasted from 1947 to 1950. The generator consisted of three component parts, the uranium crucible, the heating unit, and a cathode. The heating unit filled the space of about 140 mm existing between the crucible and the cathode. This space which is filled with a flaming arch of metallic vapor is the area in which the emission starts. At first, an attempt was made to make the crucible from heat resistant metals such as tantalum and tungsten. The crucible itself waskept small and shallow so that it could hold about 10 grams of uranium. Initially, the heating unit had a conic form and the cathode consisted of wire and units of thin sheets of tungsten, tantalum and similar metals. During the experiments, it was found that the uranium vapor produced between crucible and cathode formed new alloys on the walls of the heating unit, and these alloys changed its electric resistance and thus disturbed the constancy of the current (Stromstabilisierung). The uranium on the crucible, burned off too quickly and lasted only ~~30 minutes~~. The functioning of the metal cathode was disturbed by changing electric values in a way similar to that of the heating unit. Nevertheless, the German scientists succeeded, in early 1948, in producing an ion source of 20 mA at the collector as originally demanded by the Soviets. The Soviets then informed the Germans that ion currents of 25 mA had been obtained at the screen (slit?) of the 200-ton magnet in Leningrad and a

[redacted] 25X1

13. Only very scanty information was available on experiments made with the ultracentrifuge. [redacted] 25X1 25X1 The tubes required for this device were balanced and adjusted at the workshop of H. Richter. Test runs with the ultracentrifuge were noticed in Steenbeck's laboratory. The tubes used for the device consisted of aluminum or an aluminum alloy. The walls of the tubes were only 0.2 mm thick. The device consisted of two tube sections, each 40 to 50 cm long and 5 cm in diameter. The two sections were joined by sleeves which were not welded or sealed. A high-frequency motor was mounted at the bottom of the lower tube section. The motor was about 7 cm in diameter, and it was allegedly rated at 2.5 kW with a maximum of 300,000 rotations per minute. The tube column 25X1 was supported only at the bottom. In late 1948 [redacted] an experiment with the ultracentrifuge in a vacuum produced under a glass bell. The electric 25X1 revolution counter indicated that the ultracentrifuge reached a maximum of 240,000 revolutions per minute. In the summer of 1949, another experiment [redacted] when four tube sections were used and the total length of the column was 25X1 estimated at 180 cm. It was learned that in the summer of 1950, experiments made with a column 300 to 400 cm long led to excellent results. The plate fitted in the sleeve connecting the different tube sections was pierced by holes which took up about 25 percent of the total area of the plate. When the ultracentrifuge started rotating, the column began to vibrate like an elastic rod. With increasing number of revolutions, this vibration stopped and the intensity of the whistling sound increased. When the centrifuge operated at about 100,000 revolutions per minute, the column appeared to stand still and the noise stopped altogether. After 100,000 revolutions per minute had been reached it was comparatively easy to accelerate the ultracentrifuge to 200,000 revolutions per minute. 7

14. Only little information was available on Thiessen's department which was concerned 25X1 with chemical research work. [redacted] a high-frequency generator (Gluehsender) for Thiessen [redacted] was [redacted] not 25X1 25X1 completed [redacted] 25X1 25X1 Thiessen was also concerned with the production of UF_6 or related missions. The high-frequency generator mentioned above was to be built by order of Ardenne. The generator was to have an output of 10 kW at about 450 c.p.s. One of the specifications was an opening in the water-cooled element wires (Gluehspirale) through which a metal band measuring 2 x 22 mm was to pass. This band was to be subjected to a glowing process. Chemicals of an unidentified type were to be put on the band and the ionic emission was to be effected when the chemicals began to glow.

15. Menke was sent to the Sinop institute by mistake. He left again in February 1949, allegedly to a place in the Ural Mts. where he was to take over a completely equipped institute where prior to his arrival mostly Russians had been employed. Dr. Rintelen had left for this institute as early as February 1948, and Dr. Uhorst and Renate von Ardenne followed in the summer of 1949.

16. The German scientist at Sinop who travelled most was Schmitz (fnu). It was believed that he is familiar with the location of all Soviet atomic research institutes. [redacted] 25X1 25X1 An electronic microscope was used at Sinop in connection with efforts to stabilize the voltage used in experiments made with separating magnets. [redacted] 25X1 an impulse welding machine for the tungsten heaters of the ion source. The electrodes consisted of water-cooled copper and the output was 6 to 8 kW with 3,500 to 4,000 A. 8

magnet of the same size at another place. The requirements for the ion source were subsequently increased to 40 mA and the target was to develop an ion source which would operate continuously for 60 hours. Ardenne wanted to comply with the requirements by the insertion of an impulse device designed to stabilize the ion current. [redacted] 25X1 The 25X1 experiments made with this impulse sender were a failure. In early 1949, an attempt was made to eliminate the crucible by an arrangement designed to spray powder metal from a container fitted above the heating unit. These experiments also ended in failure.

9. In the summer of 1949, Dr. Lehmann who also worked on the development of a suitable crucible manufactured a hollow crucible consisting of pressed and sintered thorium oxide or beryllium oxide. This crucible could hold 100 grams of uranium metal and lasted 64 hours. During this time, all the uranium metal was vaporized and also the crucible burned off. The cathode was built in the form of a slotted carbon rod which replaced the metal unit of the cathode previously used. The heating unit was given parallel walls. Its internal diameter was 24 mm and the hollow crucible had the same diameter. The cooling unit of the device was improved and the ion source weighed only 65 pounds (32.5 kg). Cooling pipes were 10 mm in diameter, 1.6 liter of cooling water was consumed per second at the collector, 10 to 12 liters per second at the ion source. The cooling water had a temperature of 15 to 17° C. At last, the ion source was used without keeping the heating unit in operation all the time. The heating unit was fed a current of about 1,000 A until a gas arch had formed between the uranium and the cathode. Then the heating unit was switched off. 5

10. From 60 to 80 mm behind the exit slit of the ion source was a double screen made of tantalum (slit). The slit in the ion source and in the screen was 6 mm wide and the two screens were also spaced 6 mm. The distances could be adjusted electrically. The screen was put under a specific voltage. No further details were available.
In the summer of 1950, experiments made with the ion source had progressed so far that 120 mA were obtained at the collector with a continuous operating time of 64 hours. The Soviets then declared that the mission assigned to the German [redacted] scientists was accomplished.

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11. In August 1950, work on the construction of a new cyclotron building was started. No detailed information on the new research mission assigned to the Germans was available. [redacted] 25X1 the conversion of the ion source to a hydrogen and proton source [redacted] involved the building of a straight accelerator. Near the new building scheduled to house the cyclotron, a 50 kW transmitter and 40 sheet metal containers each with a cubage of about 0.5 cubic meters were seen. [redacted] 25X1 the Elin-type magnet had been 25X1 transferred from "House D" to the building housing the cyclotron. The sheet metal containers which had been seen near the cyclotron building were designed 25X1 to hold hydrogen. [redacted] that Dr. Zippe and Bernhard had signed 25X1 contracts to remain in the USSR for another 2 and 5 years respectively. Steenbeck (fnu) had refused to sign such a contract because his family had already 25X1 returned to Jena. [redacted] all research work at the institute was concluded not long after the fall of 1950. 6 In any event, the work conducted by the Germans at the institutes 25X1 at Sinop and Agudzera was completely separated from Soviet research work.

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12. Similar research work as at the Sinop institute was done at the Leningrad institute. No information was available whether the so-called "Elektrostal" or "Elektrosila" installation was involved. The separating magnet (electromagnetic separator) used in Leningrad had a weight of 200 tons. Dr. Froehlich, Dr. Mueller and Uerlings frequently travelled to the research institute in Leningrad. Another atomic research institute was believed to be located in the Crimea. Attached to the institute at Sinop was a Soviet high-frequency engineer called Oganesyan (fnu) who had graduated from Tiflis University.

1. [redacted] Comment. For location of the Sinop institute, see Annex 1. 25X1

2. [redacted] Comment. For layout of the institute buildings, see Annex 2.

3. [redacted] Comment. It is believed that the separating magnet was a component part of the cyclotron previously located at Miersdorf. Work on the construction of this cyclotron was started in 1940 by the research institute of the Deutsche Reichspost. In 1945, the cyclotron was shipped to the USSR. For description of the cyclotron, see "Naturforschung und Medizin in Deutschland, 1939 - 1946" (Scientific Research and Medicine in Germany from 1939 to 1946) (Fiat Review of German Science) volume 14, Nuclear Physics and Cosmic Radiation, Part II, page 32 ff.
For sketch of the separating magnet, see Annex 3.

4. [redacted] Comment. For sketch of the vacuum chamber, see Annex 4. 25X1
For sketch of the external view of the vacuum chamber, see Annex 5.
For sketch of the set up of the vacuum chamber, see Annex 6.

5. [redacted] Comment. For schematic diagram of the set up of the ion source, see Annex 7.

6. [redacted] Comment. For time schedule of the research work done at the Sinop institute, see Annex 9.

7. [redacted] Comment. For sketch of the ultracentrifuge, see Annex 8. 25X1

8. [redacted] Comment. For organizational chart of the institute, see Annex 10.

9. [redacted] Comment: [redacted]

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Legend: See next page [redacted] 25X1

Annex 1 [redacted] 25X1

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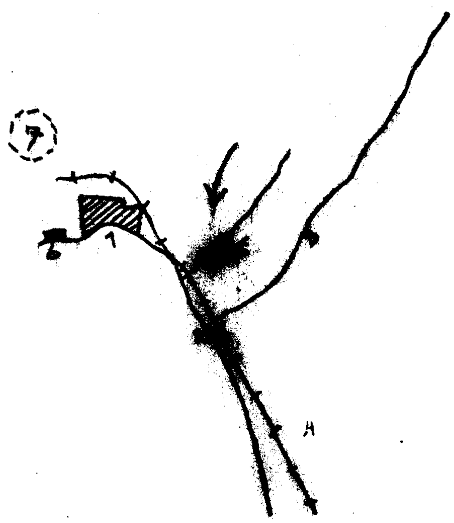

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Location Sketch of the Sinop Institute

(Scale 1:200,000)

Legend:

1 Sukhumi

2 Kelasuri railroad station

3 Kelasuri River

4 Highway

5 Area of the Sinop Institute

6 Naval barracks

7 Civil airfield

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Legend: See next page

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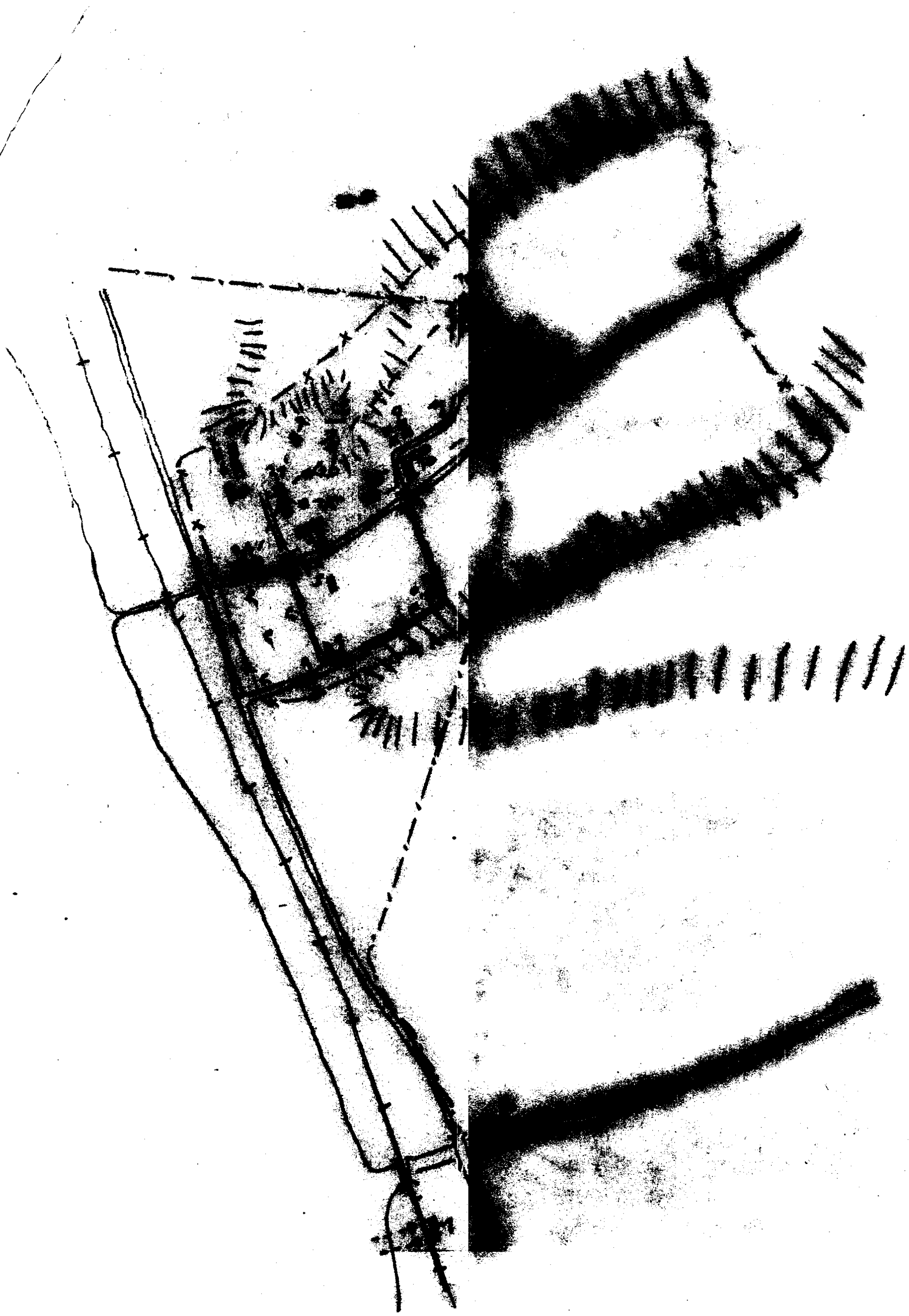

C-O-N-F-I-D-[redacted]

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Layout of the Sinop Institute

(Scale 1:10,000)

Legend:

1 Railroad station

2 Water supply for the institute

3 Guardhouse and road block

4 Soviet headquarters and administration, single-story building, 25 x 25 meters square.

5 Temporary building, accommodating approximately 30 MVD guards

6 Houses, most of them occupied by German scientists. Kochlavashvili, Steenbeck and Thiessen lived in these buildings

7 New house, erected for Manfred von Ardenne

8 So-called Stalin house

9 Old Soviet houses

10 Four-story house, 70 meters long, housing the polyclinic and the library. The southern annex, which is single-story, housed the motion picture theater

11 Shop

12 Carpenter shop

13 Laundry

14 Three-story dwelling houses for German and Soviet personnel

15 Cow shed

16 Kennel for 15 dogs

17 Garages

18 Transformer station and emergency generators

19 Gas tank, capacity 300 cubic meters, and two cracking plants

20 "Zentralstabilisierung " (?), 100 kW

21 "House J", main institute building, 4-story structure. The building housed Thiessen's Department which comprised about 20 men; Steenbeck occupied 2 or 3 rooms; Menke worked there with 12 to 15 assistants until February 1949. Three Soviet groups also had laboratories in "House J". One of these laboratories was the chemical laboratory headed by Dr. Burdoshvili (fnu). The heating installation was located in the middle section of the basement. The house contained a total of 140 rooms ranging in size from 3 x 6 meters to 6.5 x 7 meters. Gas, running water and electric light was available in all of the rooms. Switch boards were seen in four rooms. The house was scheduled eventually to went over to Tiflis University.

22 Steenbeck's laboratory, a 3-story building, about 8 x 10 meters. Development work was done there on the centrifuge

23 Main workshop, single-story building, measuring about 15 x 60 meters

24 "House D", a new building, measuring about 15 x 40 meters. The building was fenced in separately. Work with the separating magnet was done there. Persons who had access to the building included Ardenne, Froehlich, Uerlings, Bernhard, Pottmeyer, H. Franke, G. Treff, and E. Suckow.

25 Cyclotron building, a 3-story structure, about 18 x 25 meters; under construction in 1950.

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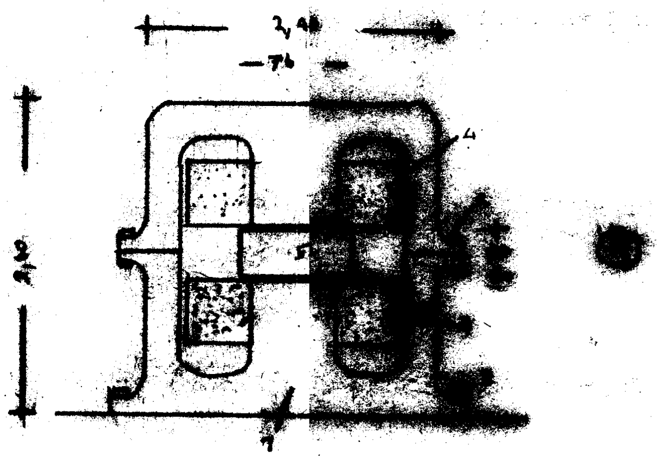

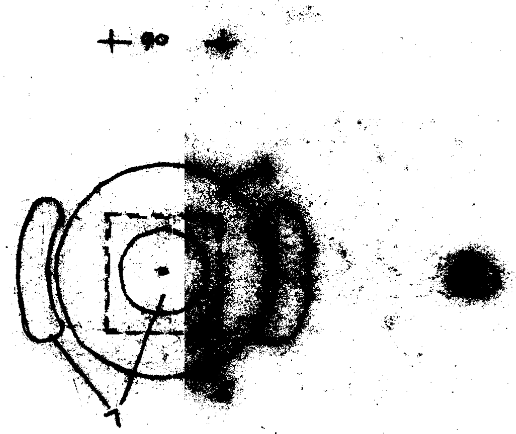

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[redacted] 25X1

Separating Magnet
(Scale 1 : 50)

Legend:

A Cross section of the magnet

B Lateral section of the magnet

1 Magnet core of cast steel, consisting of two parts

2 Fastening device for the two sections of the core

3 Fastening to the base

4 Field windings, water cooled copper tubes

5 "Vacuum chamber", 90 x 90 x 40 cm

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Legend: See next page

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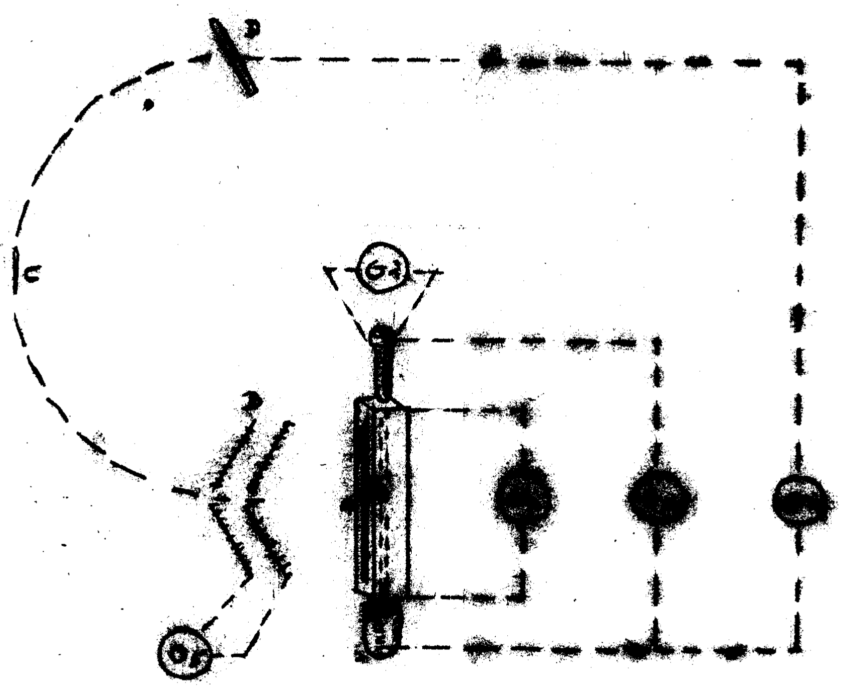

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Switching Diagram for the Vacuum Chamber

Legend:

A Ion source

B Tantalum screen with slit, adjustable

C Magnetic field

D Collector

G_1 Heating for cathode

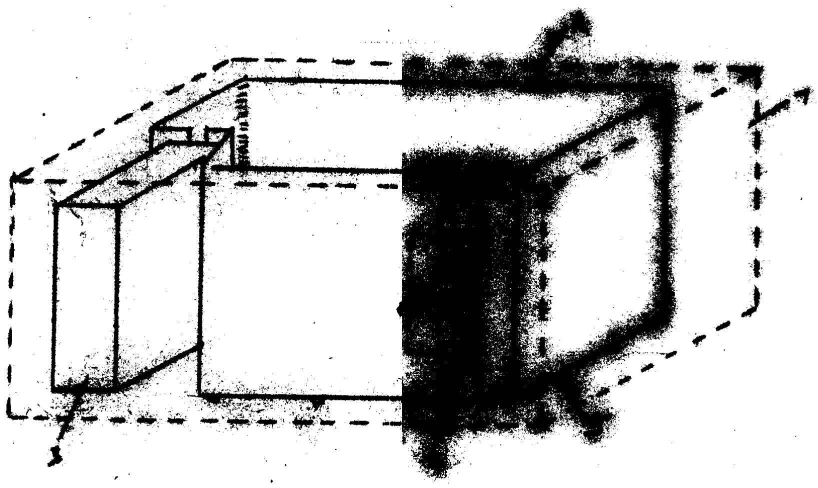
G_2 Current source, up to 1,200 A with 14 V

G_3 200 to 2,000 V with 2 A

G_4 Up to 36,000 V and 120 mA

G_5 12 to 15,000 V

Legend: See next page [redacted] 1:10 25X1



Set-up of the Vacuum Chamber

(Scale 1 : 10)

Legend:

1 Brass box, 90 x 90 x 40 cm, walls 22 mm thick

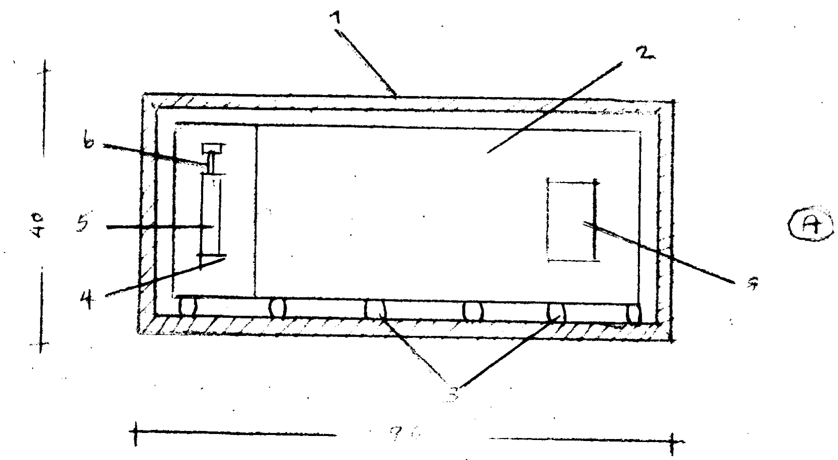
2 Inner box of wire gauze, the top and the bottom were made of sheet metal, 1 mm thick

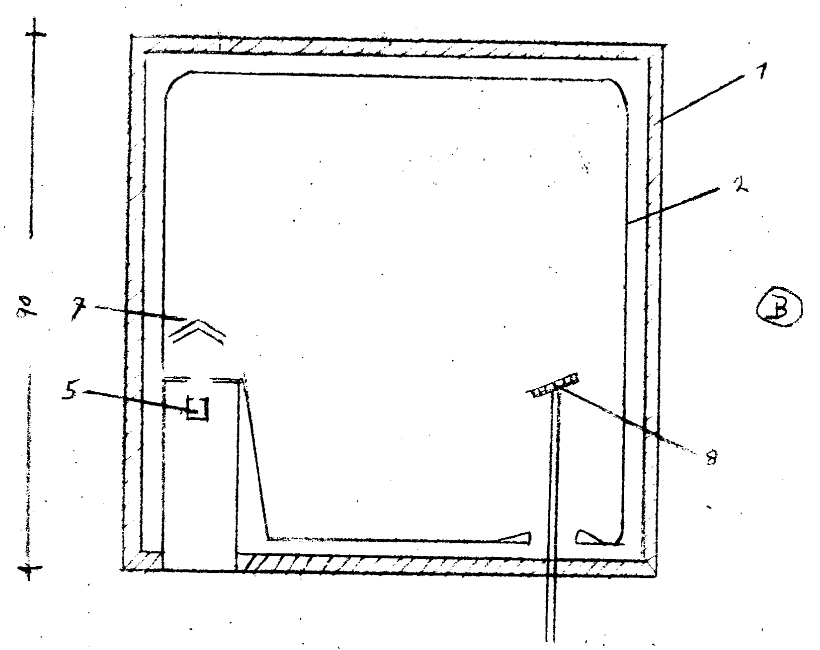
3 Case for ion source

4 Case for collector

5 Insulators designed as supports for the inner box

Legend: See next page m [redacted] 1 : 10 25X1
Annex 6 [redacted] 25X1





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Cross Sections of the Vacuum Chamber

(Scale 1 : 10)

Legend:

A Cross section

B Lateral section

1 External case, vacuum chamber

2 Inner chamber, so-called "Physikalischer Kasten" (physical box)

3 Insulators

4 Uranium crucible

5 Heating unit

6 Carbon cathode

7 Adjustable screen

8 Adjustable collector

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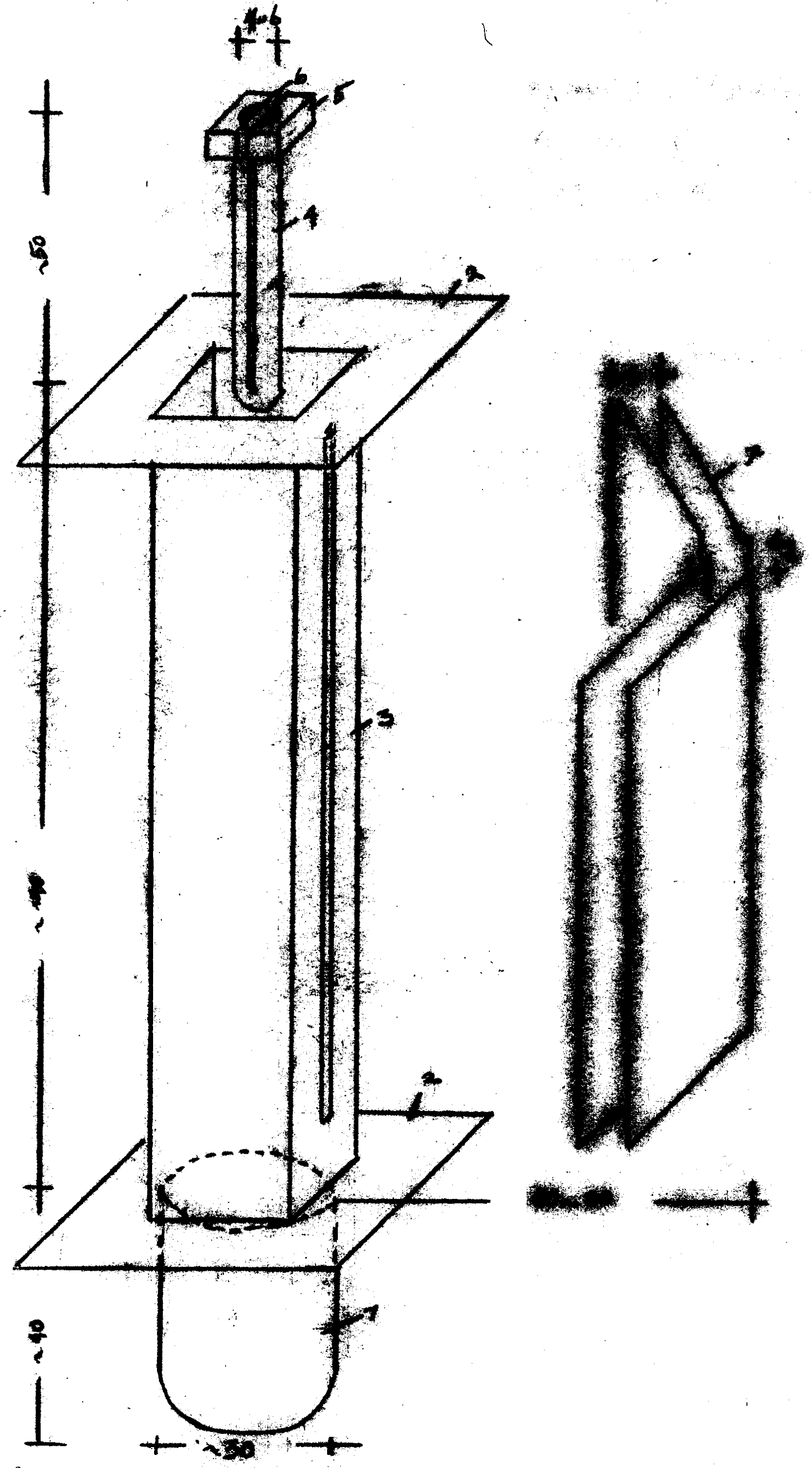
Legend: See next page [redacted] 25X1



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[redacted] 25X1

Perspective View of the Ion Source

(In full scale)

Legend:

1 Uranium crucible of thorium oxide and of beryllium oxide

2 Sheets of heating unit, each about 60 x 80 mm

3 Tungsten sheet of heating unit, about 1 mm thick. Slit for ions, about 6 mm wide

4 Carbon cathode with slit, 4 to 6 mm wide

5 Terminals of the cathode

6 Ceramic insulators in slit

7 Tantalum sereen

Temperature produced in the heating unit 2,335° C

C-O-N-F-I-D-E[redacted]

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Legend: See next page

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[redacted]

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C-O-N-F-I[redacted]

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Schematic Sketch of the Ultracentrifuge

(Scale 1 : 5)

Legend:

1 Aluminum tube, wall 0.2 mm thick, turned

2 Aluminum sleeve, wall about 1 mm thick, fitted with pierced lid

3 High frequency motor, 70 mm in diameter, output 2.5 kW

4 Vacuum under glass bell

[redacted]

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ILLEGIB

Zei[redacted]

SEPARATION MAGNET AND URANIUM METAL EVAPORATOR

(-)——

Personnel:

Assignment: Attain 20 MA ion stream

M. v. Ardenne

Dr. Froehlich (research head)

Dr. Mueller, later

Neureuther (high-frequency head)

Uerlings (liaison with Leningrad inst.)

Dr. Lehmann (uranium crucible)

Jaeger (constructor)

Suckow (high frequency) mechanic)

Lorenz (precision mechanic)

Experiment w[redacted]
impulse send[redacted]
at the colle[redacted]
tor.

The app[redacted]
(The application[redacted]
let in July 195[redacted]
New problems we[redacted]

1) Further deve[redacted]
2) Hydrogen-pro[redacted]
3) Straight acc[redacted]

Construction of[redacted]
of a 50 kw tran[redacted]
of 0.5 cu. m. f[redacted]

ULTRACENTRIFUGE (Steenbeck)

Dr. Steudel

Dr. Steudel con[redacted]
quency motor up[redacted]
periment with t[redacted]
thin tubes up t[redacted]

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